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POLYURETHANE(PU) FOAM MAT TO BE USED FOR IMPACT SOUND INSULATION

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The construction product is a polyurethane foam mat for impact sound insulation. The mats can have a profiled surface and optional layers (e.g. foil) on one or both sides. The polyurethane foam mats can contain an admixture of other materials (e.g. rubber fibres or rubber granulate), which can consist of recycled material.

The product is not covered by a harmonised European standard (hEN).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The polyurethane foam mats are used for the improvement of impact sound insulation of floors. The polyurethane foam mats are installed under floating screeds on solid slabs without contact to soil, ground- and surface water.

The assessment of the product only applies when the product is used only inside buildings in structures where it is protected from wetting and weathering.

The mats are loose-laid on the sufficiently flat solid floor slab as described in the ETA. If necessary, unevenness are even out. The mats are protected by a suitable foil or the joints between the mats are covered with a suitable adhesive tape before the screed will be built in. The screed above the insulation have at least the mass per unit area given in the ETA.

The mat joints are closely installed. Cross joints are avoided. The mats are fixed using a suitable adhesive tape to ensure that no gaps occur. Appropriate insulating edge strips are used on rising walls in order to avoid sonic bridges.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the PU-foam-mat for the intended use of 25 years when installed in the works, provided that the PU-foam-mat is subject to appropriate installation (see clause 1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works¹.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

¹ The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than the working life referred to above.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of the PU-foam-mat is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	clause 2.2.1	class E according to EN 13501-1
Basic Works Requirement 3: Hygiene, health and the environment			
2	Content, emission and/or release of dangerous substances	clause 2.2.2	Description
Basic Works Requirement 5: Protection against noise			
3	Dynamic stiffness	clause 2.2.3	level
4	Impact sound reduction	clause 2.2.4	level
5	Geometry	clause 2.2.5	levels/tolerances
6	Thickness and compressibility	clause 2.2.6	level
7	Mass per unit area or Density	clause 2.2.7	level/tolerance
8	Compressive creep	clause 2.2.8	level
9	Compressive stress/strength	clause 2.2.9	level
10	Deformation under specified load and temperature	clause 2.2.10	level

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

The level to be given and the classification respectively for each characteristic has to be representative for the dimensions, density and thickness range of the product.

The samples shall be chosen accordingly. If necessary, the tests shall be performed on samples with different dimensions, densities and thicknesses so that the worst case for each characteristic can be given.

2.2.1 Reaction to fire

The PU-foam-mats shall be tested, using the test method according to EN ISO 11925-2 and relevant for the corresponding reaction to fire class. The product shall be classified according to Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

The product shall be tested directly exposed to the thermal attack with surface and edge exposure.

Products of class D or higher are not covered by this EAD.

2.2.2 Content, emission and/or release of dangerous substances

The performance of the product related to the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer² after identifying the release scenarios (in accordance with EOTA TR 034) taking into account the intended use of the product and the Member States where the manufacturer intends his product to be made available on the market.

The identified intended release scenario for this product and intended use with respect to dangerous substances is:

- IA 2: Product with indirect contact to indoor air (e.g covered products) but possible impact on indoor air.

The use of recycled material shall always be indicated to the Technical Assessment Body. If recycled rubber is used and for the addition of polycyclic aromatic hydrocarbons (PAH) containing extender oils or PAH containing carbon black the additional assessment methods following clause 2.2.2.1 are to be performed. The assessment following clause 2.2.2.2 are to be performed for the case recycled rubber and/or nitrosamine forming agents are used.

2.2.2.1 Specific organic compounds PAH and B[a]P

If recycled rubber is used and for the addition of polycyclic aromatic hydrocarbons (PAH) containing extender oils or PAH containing carbon black the additional assessment method for the content of specific organic compounds (PAH and B[a]P) has to be determined based on the raw materials according to the testing method described in the document AfPS GS 2014:01 PAK (Annex: Testing instructions, 'Harmonised method for the determination of polycyclic aromatic hydrocarbons (PAH) in polymers').

² The manufacturer may be asked to provide to the TAB the REACH related information which he must accompany the DoP with (cf. Article 6(5) of Regulation (EU) No 305/2011).

The manufacturer is **not** obliged:

- to provide the chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
- to provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the SGDS.

Any information provided by the manufacturer regarding the chemical composition of the products may not be distributed to EOTA or to TABs.

The sample to be tested is a composite sample of at least four incremental samples collected from different areas of a batch to represent the raw material as good as possible.

The product performances to be stated in the ETA take into account the concentration of single PAH and/or the sum of PAH in mg/kg, as applied by the client.

2.2.2.2 Nitrosamines

If recycled rubber is used or nitrosamine forming agents are added to the product the additional assessment method for the content of nitrosamines has to be determined based on the raw materials following the method published by DIK (Deutsches Institut für Kautschuktechnologie e.V. in Hannover, Germany).

The sample to be tested is a composite sample taking at least four incremental samples collected from different areas of a batch to represent the raw material as good as possible.

Immediately before analysis, the raw material rubber sample is cut into pieces of about 1 mm³ particle size. About 2 g of sample are transferred to a 30 mL extraction thimble used for Soxhlet-extraction. Subsequent, extraction is performed for 24 hours at 65°C using 75 mL N-nitrosamine-free methanol with 0,1 %wt ascorbic acid in a 100 mL round bottom flask containing two boiling stones made of glass.

After cooling down, 2 mL of N-nitrosodiisopropylamine (NDiPA, approx. 0,2 µg/mL) are added as internal standard. Following, the extract is evaporated with approximately 3,5 mL/min to about 5 mL using a rotary evaporator with a 40 °C water bath and 220±10 mbar.

The resulting pre-concentrate is transferred to a test tube using a Pasteur pipette. The round bottom flask is rinsed twice with 1 mL N-nitrosamine-free methanol and the rinse solution is pooled with the pre-concentrate.

By treatment with a nitrogen stream (0,05 mL/min) the solution is adjusted to 2 mL. Extracts with high oil content need chromatographic purification. The sample is analysed within 48 hours using packed columns.

The analysis of extracted N-nitrosamines is achieved by gas chromatography using a thermal energy analyzer (TEA) as detector. The conditions for gas chromatographic analysis are shown in table 2.

Table 2: Conditions for gas chromatographic analysis of N-nitrosamines

Nitrosamine	NDMA, NDEA, NDPA, NDBA, NPIP, NPYR, NMOR, NDiPA	NMPA, NEPA
column	silanized glass column (l = 2 m, ID = 1 mm)	
Stat. phase	10 % Carbowax 20 M, 2 % KOH on Chromosorb HAW 80/100 mesh	10 % OV 101 on Chromosorb HAW 80/100 mesh
Carrier gas	helium	
Carrier gas flow	30 mL/min	
Sample injection	on column	
Injector temperature	200 °C	
Temperature program	125 °C 2 min isothermal 125 °C – 175 °C (10 °C/min) 175 °C 5 min isothermal	100 °C – 200 °C (10 °C/min)
Sample volume	5 µL	5 µL

The stated product performances in the ETA take into account the concentration of the relevant N-nitrosamines [$\mu\text{g}/\text{kg}$], certain limits of determination and detection limits, as applied by the client.

2.2.2.3 SVOC and VOC

Semi-volatile organic compounds (SVOC) and volatile organic compounds (VOC) have to be determined in accordance with EN 16516. The loading factor $0,4 \text{ m}^2/\text{m}^3$ is to be used for emission testing.

Testing is performed with proportionally open edges calculated as follows:

$$\text{Open edge [m]} = 1,2 [\text{m}/\text{m}^2] \times \text{area of test specimen [m}^2\text{]}$$

The edges of the product should be sealed with self-adhesive, VOC-free aluminum foil or by the use of a suitable frame. It has to be ensured that no emission derives from the back side.

Once the test specimen has been produced, it should immediately be placed in the emission test chamber. This time is considered the starting time of the emission test.

The test results have to be reported for the relevant parameters (e.g. chamber size, temperature and relative humidity, air exchange rate, loading factor, size of test specimen, edge sealing, conditioning, production date, arrival date, test period, test result etc.).

The determination of Benzothiazole is performed substance specific.

The test results have to be reported for the relevant parameters (e.g. chamber size, temperature and relative humidity, air exchange rate, loading factor, size of test specimen, edge sealing, conditioning, production date, arrival date, test period, test result).

The relevant product performances, as applied by the client, shall be expressed in [mg/m^3] and stated in the ETA.

2.2.3 Dynamic stiffness

The determination of dynamic stiffness s' or s'_t shall be carried out according to EN 29052-1.

In case of use under heated screed the dynamic stiffness shall be determined before and after the test of the deformation according to clause 2.2.10.

The mean dynamic stiffness s' or s'_t (if need be, for different thicknesses) is given in the ETA using levels in steps of 1 MN/m³. An individual value may exceed the given level by at most 10 %.

In case of use under heated screed the dynamic stiffness after deformation according to clause 2.2.10 shall not exceed the initial dynamic stiffness (level) by more than 10 %.

Note: The dynamic stiffness is not intended for calculation of impact sound reduction of a floor build-up. Only the impact sound reduction according to clause 2.2.4 shall be used for the design of protection against noise.

2.2.4 Impact sound reduction

The impact sound reduction ΔL by floating screeds on a heavyweight standard floor using the PU-foam-mat shall be determined according to EN ISO 10140-1, EN ISO 10140-3, EN ISO 10140-4 and EN ISO 10140-5 as appropriate using the provisions of category II according to Annex H, clause H.2.2.2 of EN ISO 10140-1. Using this data the weighted impact sound reduction ΔL_w is calculated according to EN ISO 717-2.

The test shall be performed with the floor build-up representing the worst case for impact sound reduction (e.g. minimum mass per unit area of the floating screed and thinnest PU-foam-mat covered by the ETA). If need be, the tests shall be carried out with several build-ups.

The weighted impact sound reduction ΔL_w (if need be, for different build-ups) is given in the ETA considering a reduction of 2 dB to take influence of ageing into account.

Declared $\Delta L_w = \Delta L_w - 2$ dB

The assessed floor build-up shall be described in detail in the ETA. It shall be stated clearly to which floor build-up the given impact sound reduction applies. In particular the minimum mass per unit area of the screed is given in the ETA.

Note: The reduction of 2 dB for ageing can be reduced by measurements in buildings as follows.

To determine the influence of ageing measurements in line with EN ISO 10140 shall be carried out in at least one building executed to determine the impact sound reduction. Here, the impact sound reduction shall be determined immediately after installation of (each) floor build-up and after at least two years of use by using the following procedure:

- 1) *Measurement of the impact sound insulation of the floor slab (without floor build-up)*
- 2) *Measurement of the impact sound insulation of the complete floor (including floor build-up) immediately after installation and determination of the weighted impact sound reduction according to EN ISO 717-2*
- 3) *Measurement of the impact sound insulation of the complete floor (including floor build-up) after at least two years of use and determination of the weighted impact sound reduction according to EN ISO 717-2*

2.2.5 Geometry

The length and width of the PU-foam-mat shall be determined on at least three test specimens in accordance with EN 822.

The squareness shall be determined on at least three test specimens in accordance with EN 824.

The nominal length and width are given in the ETA. The deviation from nominal width and nominal length are given in the ETA using the classes according to EN 16069.

The deviation from the squareness in the direction of length and width shall not exceed 5 mm/m according to EN 16069.

2.2.6 Thickness and compressibility

The determination of thickness d_L and d_B shall be carried out according to EN 12431 with at least 3 test samples. The thickness d_B shall be determined with a pause of 300 s before measuring. The determination shall be performed for each nominal thickness of the product or at least for the maximum nominal thickness covered by the ETA.

The compressibility c is defined as follows: $c = d_L - d_B$

The nominal thickness d_L is given in the ETA as a minimum level. The maximum compressibility c is given in the ETA.

2.2.7 Mass per unit area or density

The mass per unit area or the density is to be determined on samples on which the thickness d_L was determined. EN 1602 – Thermal insulating products for building applications – Determination of the apparent density - shall be used as a basis.

The mass per unit area or the density including the tolerances is given in the ETA.

2.2.8 Compressive creep

The test is only necessary if the imposed load on the screed exceeds 5 kPa.

The compressive creep and the total thickness reduction shall be determined after 122 days of testing with at least the imposed load plus self-weight of the screed in accordance with EN 1606 and extrapolated 30 times, corresponding to 10 years.

The compressive creep and the total thickness reduction are given in the ETA.

2.2.9 Compressive stress / strength

Compressive stress at 10 % deformation or compressive strength shall be determined according to EN 826 with at least 5 test samples of 200 mm x 200 mm.

If necessary, the compressive stress at 20 % deformation can be determined exceptionally deviating from EN 826.

The minimum level is given in the ETA.

2.2.10 Deformation under specified load and temperature

Deformation in thickness under specified load and temperature shall be determined on the basis of EN 1605 with at least 3 test samples of at least 150 mm x 150 mm. Deviating from EN 1605 the following test conditions shall be used:

in case of an unheated screed: - compressive load: 20 kPa
 - temperature and time: step A: $(23 \pm 5)^\circ\text{C}$ / (48 ± 1) h
 step B: $(35 \pm 1)^\circ\text{C}$ / (48 ± 1) h

in case of a heated screed: - compressive load: 20 kPa
 - temperature and time: step A: $(23 \pm 5)^\circ\text{C}$ / (48 ± 1) h
 step B: $(60 \pm 1)^\circ\text{C}$ / (48 ± 1) h

The normative test conditions 1, 2 or 3 according to EN 1605 can also be used depending on the intended use.

The maximum change of the relative deformation in % (difference between the relative deformation ϵ_1 after step A and ϵ_2 after step B) is given in the ETA.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: Decision 2000/273/EC

The system is: 3 for any use except for uses subject to regulations on reaction to fire performance.

For uses subject to regulations on reaction to fire the applicable AVCP systems are 1, 3 or 4 depending on the conditions defined in the said Decision.

The PU-foam-mat will at most be a product of reaction to fire class E. Products of class D or higher are not covered by this EAD.

Therefore the system with regard to reaction to fire is: 3

3.2 Tasks of the manufacturer

The corner stones of the actions to be undertaken by the manufacturer of PU-foam-mat in the procedure of assessment and verification of constancy of performance are laid down in Table 3.

Table 3: Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control *
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Reaction to fire	EN ISO 11925-2	see 2.2.1	1	once per week
2	Specific organic compounds PAH and B[a]P, if recycled rubber is used and/or if PAH containing extender oils or PAH containing carbon black are added	2.2.2.1	See control plan	1	Every batch**
	Nitrosamines, if recycled rubber and/or nitrosamine forming agents are used	2.2.2.2	See control plan	1	Every 5 th batch**
	SVOC and VOC	2.2.2.3	See control plan	1	Every 250 t of product, at least quarterly***
3	Dynamic stiffness	see 2.2.3	see control plan	see test standard	once per week
4	Impact sound reduction	see 2.2.4	see control plan	1	once per year
5	Geometry	see 2.2.5	see control plan	1	once per day
6	Thickness d _L	see 2.2.6	see control plan	3	once per day
7	Compressibility	see 2.2.6	see control plan	3	once per week
8	Mass per unit area or density	see 2.2.7	see control plan	3	once per day
9	Compressive stress / strength	see 2.2.9	see control plan	3	once per week
10	Deformation under specified load and temperature	see 2.2.10	see control plan	3	twice per year
* In case of discontinuous production these minimum frequencies should be adapted to an equivalent frequency.					
** A batch is considered to be the portioned raw material of defined particle size fraction in a maximum 3000 kg, which is then processed into the respective product.					
*** Depending on the actual production volume.					

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment is of relevance.

EN 822	Thermal insulating products for building applications - Determination of length and width
EN 824	Thermal insulating products for building applications - Determination of squareness
EN 826	Thermal insulating products for building applications - Determination of compression behaviour
EN 1602	Thermal insulating products for building applications - Determination of the apparent density
EN 1605	Thermal insulating products for building applications - Determination of deformation under specified compressive load and temperature conditions
EN 1606	Thermal insulating products for building applications - Determination of compressive creep
EN 12431	Thermal insulating products for building applications - Determination of thickness for floating floor insulating products
EN 13501-1	Fire classification of construction products and building elements - Part 1: Classification using test data from fire reaction to fire tests
EN 16069	Thermal insulating products for buildings – Factory made products of polyethylene foam (PEF) - Specification
EN 29052-1	Acoustics; Determination of dynamic stiffness; Part 1: Materials used under floating floors in dwellings
EN ISO 10140	Acoustics - Laboratory measurement of sound insulation of building elements
EN ISO 717-2	Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation
EN ISO 11925-2	Reaction to fire tests for building products - Part 2: Ignitability when subjected to direct impingement of flame
EOTA TR 034	General BWR 3 Checklist for EADs/ETAs - Content and/or release of dangerous substances in construction products
EN 16516:2017	Construction products – Assessment of release of dangerous substances – Determination of emissions into indoor air
AfPS GS 2014:01	PAK – Testing and assessment of polycyclic aromatic hydrocarbons (PAHs) in the course of awarding the GS mark; Annex: Testing instructions, 'Harmonised method for the determination of polycyclic aromatic hydrocarbons (PAH) in polymers'

Kautschuk Gummi Kunststoffe, 1991, 44, pp. 514-521: 'Methods for the determination of N-nitrosamines in air, vulcanizates and vulcanization fumes', Liekefeld, R. et al.